Preface

Notice

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This manual version 1.0

About this manual

Intended user

This manual is designed and written for users of the ACS-76130 RAID controller. The user should ideally be familiar with RAID planning and data storage operations and have experience in electronic or computer engineering.

Organization of the manual

This manual consists of the following sections:

Chapter 1: **Introduction** provides details of key features, checklists of package contents and user requirements, and an overview of the RAID box and its features.

Chapter 2: **Before you begin** contains all the information you need to decide whether to set up a RAID 0 or RAID 5 array and lists important pre-installation notices.

Chapter 3: **Setting up the controller** guides you through process of installing ACS-76130 in a system or externally and explains how to replace drives.

Chapter 4: **Initializing the array** explains how to launch the automatic initialization process.

Chapter 5: **Formatting** tells you how partition and format the array so that your system can start using it.

Appendix A: **FAQ** helps you deal with encountered problems in the form of Q&A.

Appendix B: **Glossary** defines relevant technical terms used in this manual.

Appendix C: **Specifications** list technical specification of ACS-76130.

Appendix D: **Regulatory Information** provides information of related certification and standards.

Appendix E: **Contact Us** lists contact details of Accusys business units around the world.

Using this manual

This guide contains all the information you need to set up and start using your RAID controller and to monitor its performance in real time. The setup process will follow these steps:

Step 1

Prepare: Familiarize yourself with the features and capabilities of ACS-76130 (**Chapter 1**)
Decide whether to set up a RAID 0 or RAID 5 array (**Chapter 2**)

Step 2

Configure: Set up the controller (Chapter 3)

Step 3

Install: Attach the necessary cables and either mount the RAID box inside your system or set up the RAID box externally (**Chapter 3**)

Step 4

Initialize: Initialize the array (**Chapter 4**)

Step 5

Format: Partition the array to enable your computer's operating system to begin using it (**Chapter 5**)
Format the array (**Chapter 5**)

When you have reached this point, your RAID controller will be ready for use. To get the most from ACS-76130, you should also set up the ACSView GUI on your system. With this browser you can monitor the status of your array at any time and from any computer on your LAN. You will find full installation instructions and information on the monitoring capabilities of ACSView in the ACS-76130 ACSView User's Manual. Ask your vendor for details.

Guide to Conventions

Important information that users should be aware of is indicated with the following icons:

Caution

This icons indicates the existence of a potential hazard that could result in personal injury, damage to your equipment or loss of data if the safety instruction is not observed.

Note

This icon indicates useful tips on getting the most from your RAID controller.

Important terms, commands and programs are put in **Boldface** font.

Screen text is given in **`screen`** font.

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Chapter 1

Introduction

This chapter introduces the features and capabilities of ACS-76130.

You will find:

- **A full introduction to your ACS-76130 controller**
- **Details of key features**
- **A checklist of package contents**
- **A checklist of what else you need to start installation**
- **An overview of the RAID box and its features, including connectors, LEDs and jumpers**

Overview

Congratulations on your selection of the Accusys 76130 (ACS-76130). The ACS-76130 is a high-performance and extremely flexible RAID (Redundant Array of Independent/Inexpensive Disks) controller. RAID is a storage technology used to improve the processing capabilities of a storage system, providing a combination of reliability and performance.

The ACS-76130 is the ultimate approach to a flexible RAID solution. It can manage two different RAID levels (0 and 5), with three SATA disks in a single RAID group. With a cost-effective SATA approach, supporting Ultra DMA mode, the ACS-76130 strips data to three disk drives simultaneously, and delivers optimized performance, comparable to more costly SCSI based solutions.

Featuring intelligent online recovery, the ACS-76130 lets you hot swap a failed drive: data will automatically be rebuilt to the new drive without any system down time. If a RAID 5 array exists and one SATA disk drive fails, data is secured by the other drives, and an alarm sounds to alert you. RAID 5 rebuild will proceed automatically (during power on) as soon as you lock the disk carrier. If a RAID 0 array fails, there is no way to recover the data of the RAID system. You should proceed by reconfiguring the new RAID with a new SATA disk.

The ACS-76130 RAID box features a user-friendly rack design that lets you easily install three drives. Each drive carrier supports a one-inch high 3.5-inch form factor drive. Security is provided by a key-locking system that prevents unauthorized access to each disk drive.

Key features

The ACS-76130 supports the following features:

- Support 3 SATA-I disk channels.
- Support one SATA-I host channel
- Support RAID level 0 and 5
- Drives are hot swappable
- Hot transparent and OS independent
- Fan cooler (Ball bearing type)
- Support ATA-6 big drive
- Key locking to prevent unauthorized access to the disk drives
- Audible alarm on drive failure
- Automatic drive failure detection
- Automatic online rebuilding
- Audible alarm on drive failure
- Battery backup for disk rebuild status

Hard drive hot swapping

Hot Swapping allows for the removal and installation of disk drives without the need to power down the system while ACS-76130 is configured as a RAID 5 array.

Automatic drive rebuilding

If a member drive in a RAID 5 array is replaced on-line, the controller will automatically start to rebuild data to the new drive.

Making sure you have everything

What's in the box

Some vendors may ship certain components as standard, while other vendors treat the same component as optional. In its most basic configuration, your package should include the following:

- ACS-76130 RAID box
- ACS-76130 Controller User's Manual and GUI management software
- Three disk drive carriers with key locks
- Disk drive mounting screws
- Two keys for drive carriers (identical)

What else you need

In order to setup a working system the following user-supplied items are required:

- System with SATA Interface
- Case with two half-height 5 ¼" drive bays with front bezel access
- One SATA channel cable connector
- One free power supply connector at least

One 3-pin RS232 cable connector (data connection for GUI interface, if required)

Familiarizing yourself with the controller

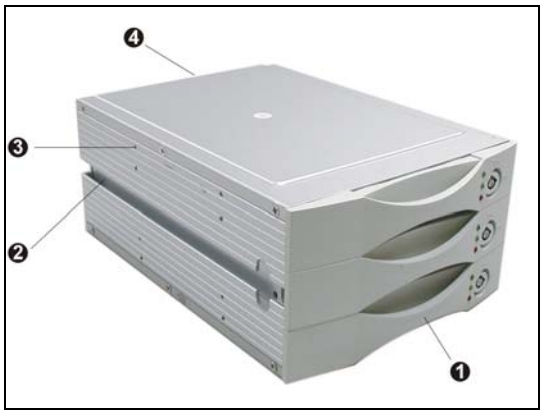
Overview

The RAID box has three **drive carriers**, accessed from the front.

The sides of the box each feature a **guide rail channel** and **mounting screw holes** to enable the box to be secured inside a computer case.

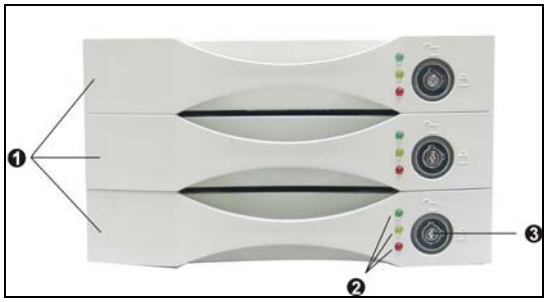
The **connectors and jumpers** are located on the rear panel.

❶	Front / Drive carriers
❷	Guide rail channel
❸	Holes for mounting screws
❹	Rear / Connectors & jumpers



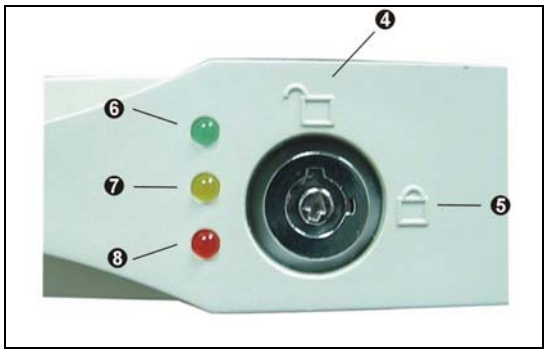
Front view

❶	Three Drive Carriers
❷	Disk Activity Indicators
❸	Drive Carrier Lock



Each drive carrier can hold a one-inch high 3.5-inch form factor SATA disk drive. This makes it easy to hot swap a drive in the event of a failure, without affecting the status of the remaining drives.

❹	Drive Carrier Lock – Unlocked orientation
❺	Drive Carrier Lock – Locked orientation
❻	Green Disk Activity Indicator
❼	Amber Disk Activity Indicator
❽	Red Disk Activity Indicator



Disk Activity Indicators

These indicators show the status of each individual disk drive.

Indicator	Disk Activity
Green	Disk drive is properly installed and locked
Amber	Disk drive is being accessed
Red	Disk drive is not present, is not properly installed, is unlocked, or disk has failed
Red Flashing	Disk drive is rebuilding data

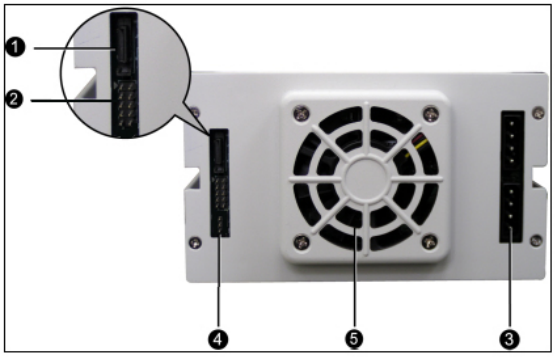
In the event that a drive fails, the Red indicator turns on and an alarm sounds. You can turn off the alarm by unlocking the drive carrier.

The drive carrier lock acts as an On/Off switch for the drives and provides security by preventing non-key holders from accessing the drives.

To lock each carrier, insert the key and turn it in a clockwise direction. To unlock a carrier, turn the key in a counterclockwise direction.

Rear view

❶	Connector for SATA interface cable
❷	RAID level configuration jumper pins
❸	Power connector
❹	3-pin RS232 connector (Terminal port)
❺	Cooling fan vent



The **SATA cable** is the route used for reading and writing to the array.

The **power connector** supplies power to the RAID box. In order to provide stable power, we recommend to connect both power connectors on the RAID box.

The **3-pin RS-232 cable** is used for remote monitoring of ACS-76130. The RS-232 port is configured with DTE and PC compatible pin assignments.

There is a **triangular symbol** "▲" on both PCB connector and RS-232 cable connector, please make sure you connect in the right direction (both triangle symbols match each other). Connecting in wrong direction will not damage RAID controller, however the terminal or GUI will not work.

The **cooling fan** inside the RAID box provides air circulation for the disk drives.

Chapter 2

Before you begin

This chapter contains includes all the information you need to decide which RAID level to use and to prepare for installation. You will find:

- ⇨ **A full introduction to and comparison of RAID levels 0 and 5**
- ⇨ **Important notices on the safe operation and installation of ACS-76130**

Pre-installation planning

Introduction to RAID levels

The ACS-76130 can support the following RAID levels: 0 and 5. Which is the right level for you? The answer depends on the application it is used for.

RAID Level 0 offers high transfer rates, and is ideal for large blocks of data where speed is of importance. Computer Aided Design, Graphics, Scientific Computing, Image and Multimedia applications are all good examples. If one drive in a RAID 0 array fails however, the data on the whole array is lost.

RAID Level 5 arrays offer high I/O transaction rates, and are the ideal choice when used with on-line transaction processing applications, such as those used in banks, insurance companies, hospitals, and all manner of office environments. These applications typically perform large numbers of concurrent requests, each of which makes a small number of disk accesses. If one drive in a RAID 5 array fails, the lost data can be rebuilt from data on the functioning disks.

Further information on RAID concepts can be found in Appendix B, Glossary.

RAID 0

RAID 0 links each drive in the array as one huge drive. Storage capacity is determined by the smallest drive in the array. That capacity is then applied to format all other drives in the array. If using a 40 GB, 60 GB, and 50 GB drive in a RAID 0 array, your system will see one huge drive of 120 GB (40 GB×3).

RAID 0 offers double or more performance under sustained data transfers when one drive per ATA port is used. In such a configuration, unlike SCSI, ATA drives are always available to the system. SCSI requires more management of the SCSI bus.

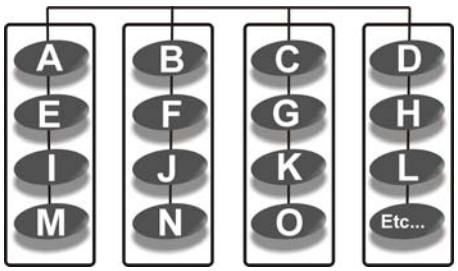
RAID 0: *Striped disk array without fault tolerance*

Characteristics:

- RAID 0 implements a striped disk array, the data is broken down into blocks and each block is written to a separate disk drive.
- I/O performance is greatly improved by spreading the I/O load across many channels and drives.
- Fastest and most efficient array type but offers no fault-tolerance.
- Storage capacity = (No. of disks) × (capacity of smallest disk)

Recommended use:

- Video production and editing
- Image editing
- Pre-press applications
- Any application requiring high bandwidth

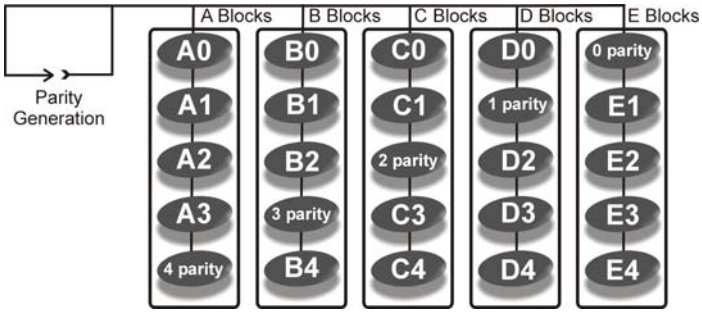


Arrangement of data blocks saved on a Level 0 RAID

RAID 5

RAID 5 uses a mathematical expression that compares data from two drives and calculates a third piece of data called “parity”. Should one of the drives fail, parity data can be used to rebuild the failed data. Under RAID 5, parity data is stored across all drives in the array. This maximizes the amount of storage capacity available from all drives in the array while still providing data redundancy.

RAID 5: *Independent data disks with distributed parity blocks*	
Characteristics: ▪ Each entire data block is written on a data disk. Parity for blocks in the same rank is generated on Writes, recorded in a distributed location and checked on Reads. ▪ Highest Read data transaction, medium Write data transaction rate. ▪ Relatively low ratio of ECC (Parity) disks to data disks means high efficiency (compared to other RAID levels). ▪ Good aggregate transfer rate. ▪ Storage capacity = (No. of disks – 1) × (capacity of smallest disk)	**Recommended use:** ▪ File and application servers ▪ Database servers ▪ WWW, E-mail and News servers ▪ Intranet servers ▪ Most versatile Raid level



Arrangement of data and parity blocks saved on a Level 5 RAID

Pre-installation notices

Caution

Before starting any kind of hardware installation, please ensure that all power switches have been turned off and all power cords disconnected to prevent personal injury and damage to the hardware.

Caution

To avoid overheating, ACS-76130 should be installed in a well-ventilated area and in such a way that sufficient airflow is maintained across the controller chips.

Caution

Static electricity can damage electronic components. To guard against such damage:

Work in a static-free environment

Wear a grounded anti-static wrist strap

Store uninstalled components in anti-static bags

Handle PCBs by their edges and avoid touching chips and connectors.

Caution

Environmental requirements: *Temperature: 0-50C*

Humidity: 5-95%, non-condensing

Altitude: Sea level to 10,000 ft

Chapter 3

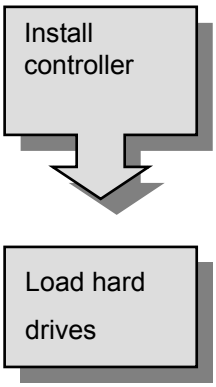
Setting up the controller

This chapter explains how to:

- ⇨ **Set RAID level on RAID box**
- ⇨ **Install the RAID controller in a system or externally**
- ⇨ **Load hard drives into ACS-76130**
- ⇨ **Swap drives**

Installation flowchart

Installation of ACS-76130 is simple. This chapter will lead you though the following steps:



- When the controller is fully configured, connect a power and SATA cable and install it either in a system or externally.
- When the controller is installed, load a hard drive into each of the drive carriers

Setting configurations

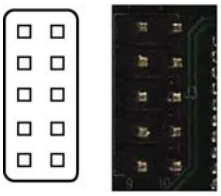
The RAID (level 0 or 5) is set manually by placing jumper heads on the ten jumper pins on the rear of the RAID box.

RAID 0 configuration

1. Make sure the power is turned off.
2. Place two jumper caps over the top pairs of RAID configuration jumper pins.

RAID 5 configuration

1. Make sure the power is turned off.
2. Make sure the ten RAID configuration jumper pins are clear of any jumper caps.



Mounting RAID box

The ACS-76130 RAID box can be installed inside a computer case or set up externally. This section describes both procedures.

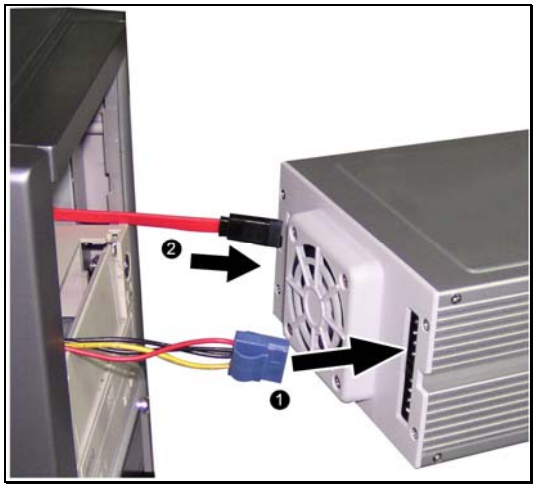
Caution

Turn off and disconnect all electrical power from the system before beginning installation.

Mounting RAID box in system

The ACS-76130 RAID box fits into the space of two half-height 5¼-inch drive bays.

1. Remove the cover and front bezel from the system case.
2. Feed a power cable ❶ through the opening.
3. Feed an SATA cable ❷ through the opening.
4. Connect the two cables to the connectors on the rear of the RAID box.
5. If planning to use the ACSView GUI to monitor the status of your RAID, you should also connect a 3-pin RS-232 cable to the terminal on the RAID box.



6. Insert the RAID box into the bay, and secure it in place with the screws provided. (If your case uses guide rails to install 5¼-inch devices, you can use them on the RAID box.)

Note

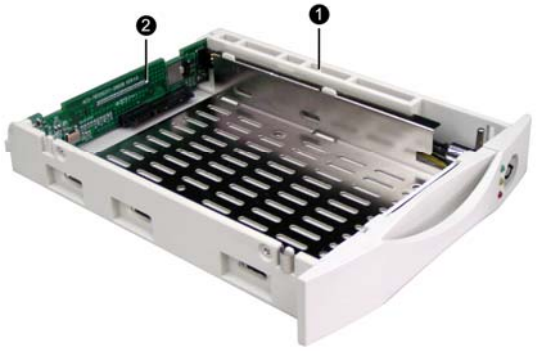
In order to provide stable power, we recommend to connect both power connectors on the RAID box.

Loading drives in the RAID box

There are one type of drive carrier available:

1. Fixed SATA connector

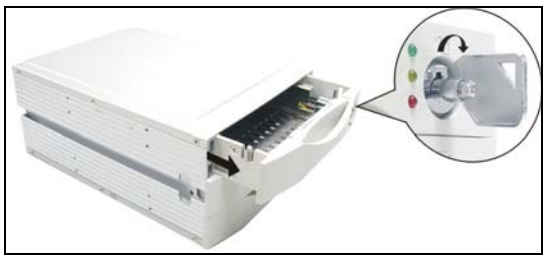
❶	Drive Carrier
❷	Fixed SATA Connector

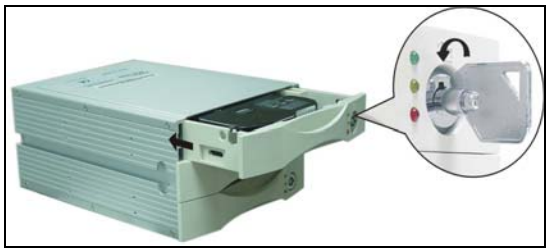


Fixed connector drive carrier

The ACS-76130 should be fitted with three hard disk drives (HDDs). Load each drive into a drive carrier as follows:

1. Unlock the drive carrier and slide it out of the RAID box.
2. Place the disk drive in the drive carrier, so that the SATA connector is lined up with the connector inside the carrier.
3. Carefully push the disk drive so that the drive's SATA connector is seated securely into the SATA connector in the disk carrier.
4. Secure the disk drive by screwing it to the drive carrier case.
5. Slide the loaded disk drive carrier into the ACS-76130 RAID Box and lock it.





Note

The disk carrier connector at the back of each RAID box disk carrier slot can be damaged if the disk carrier is not properly aligned when inserted. Insert the disk carrier gently to avoid damage.

Removing / replacing a drive

Swapping drives

The hot swap function is available on the RAID 5 array and can be operated during run time. RAID rebuilding will be processed automatically in the background and the ACS-76130 RAID subsystem will record its progress. If the host system is shut down or powered off abnormally, the ACS-76130 RAID subsystem will continue the disk rebuilding process after power is turned on again.

> **Note**
>
> *A hard disk should not be replaced when the system is turned off. Doing so may leads to loss of data. Always hot swap disks in a RAID5 array.*

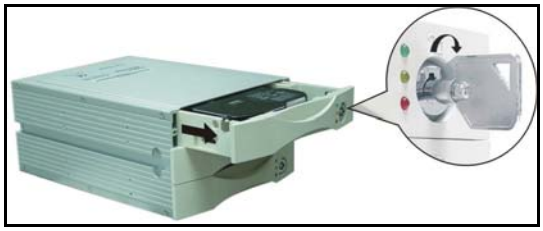
What if a disk fails?

If a disk drive fails, or a key switch is turned off, the red disk activity indicator of its disk carrier will light and the alarm will sound. When this happens, you can replace the failed SATA disk with a new one, then turn the key switch on.

> **Note**
>
> *The failure or removal of a single drive in a **RAID5** array **will not** lead to failure of the array. The failure or removal of a single drive in a **RAID0** array **will** lead to loss of all data on the array and the entire array must be re-initialized.*

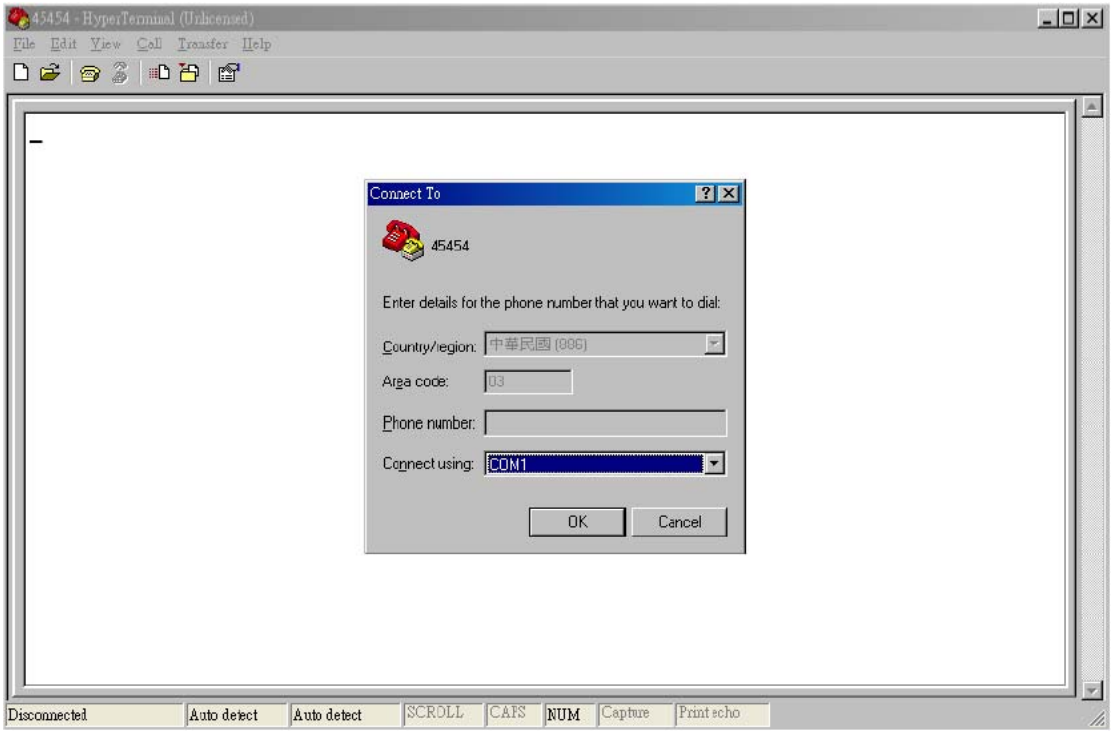
Removing a drive from a fixed connector drive carrier

1. Unlock the appropriate disk carrier. The red disk activity indicator will light.
2. Slide the drive carrier out of its slot.
3. Slide the disk drive to the front of the carrier so that the SATA connector is freed from the drive carrier.
4. Lift out the disk drive.

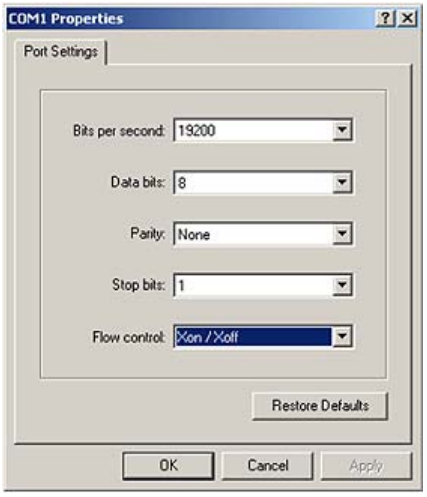


Firmware updating steps

1. Ensure the ACS-76130 is turned off.
2. Connect the RS-232 cable to the RS-232 3pin port (Please refer the page 10 "**Rear View**"), and connect the other end to one of the host computer's COM port.
3. Launch HyperTerminal from the host computer: Start > Programs > Accessories > Communications > HyperTerminal.
4. Select COM1 or COM2 from the Connect using: dropdown menu, depending on which port is connecter to ACS-76130.



5. The COM properties dialog box will appear. Set the following values:



Bit per second: 19200

Data bits: 8

Parity: None

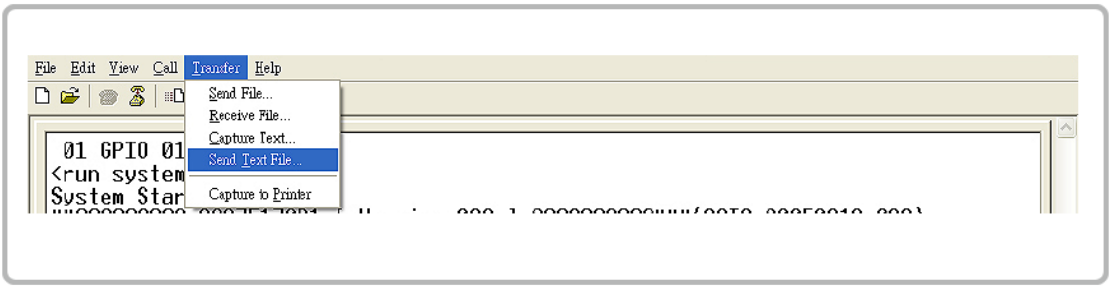
Stop bits: 1

Flow Control: Xon/Xoff

6. Turn on the ACS-76130 and press the **ESC** button on the host computer keyboard. The “>>>” prompt will appear.
7. Type in the command “download” to go to the firmware download mode, then type “1” to download code (Firmware or Bootcode).

```
>>> download

restart ... 01 GPIO 01 AAA 01 01

========= 76 Download Mode =========

Enter '1'      to Download Code (Firmware, Bootcode)

      'ESC'    exit
```

8. Locate the updates firmware file to send. For HyperTerminal, go to the **Transfer** menu and select **Send Text File**.



9. Send the firmware file as a text file. The file will start to download.

Caution

Do not turn off the system or interrupt program during firmware-updating procedure.

10. When the file has been downloaded, after ACS-76130 restarted, the firmware-updating procedure is finished.

Chapter 4

Initializing the array

Once ACS-76130 is set up and connected, the array should be initialized. The initialization process is automatic.

- If system power is off and ACS-76130 is fully set up, simply turn on system power. The system will detect the presence of ACS-76130 and ACS-76130 will check the status of the HDDs. Initialization will start.
- If system power is already on, key off then key on each of the drives in turn. You should wait for the green disk activity indicator to light for each drive before keying on the next drive.

Initialization and RAID status is shown by the disk activity indicators. Once a drive has been located and its working status confirmed, the green indicator for that drive will light.

Indicator	Disk Activity
Green	Disk drive is properly installed and locked
Amber	Disk drive is being accessed
Red	Disk drive is not present, is not properly installed, is unlocked, or disk has failed
Red Flashing	Disk drive is rebuilding data

If a red disk activity indicator shows, check to make sure the appropriate drive is:

- Locked
- Installed correctly
- Not faulty (if necessary, the drive should be replaced).

During array initialization, the following will be observed:

Indicator	Status
Green	Solid
Amber	Solid
Red	Flashing
Alarm	Intermittent

Note

If system power is turned off midway through array initialization, the process will continue from its point of interruption when power returns.

Caution

Risk of Explosion if Battery is replaced by an Incorrect Type. Dispose of Used Batteries According to the Instructions

Appendix A
FAQ

If you encounter a problem while using the ACS-76130, check this section for help.

1. **When I lock a drive carrier with a disk drive in place, the red disk activity indicator turns on and an alarm beep sounds. Why?**
   (a) Make sure you firmly connect the SATA connector of the HDD to their counterparts inside the drive carrier and try again. If this does not solve the situation, go to (b).
   (b) Change the disk drive with a new one and try again.
   (c) Exchange the top and bottom drive carriers and try again to determine if the carrier itself is faulty.
   (d) If all of the above steps fail, contact your vendor.

2. **How can I turn off the alarm beep sound when there is a hard disk failure?**
   Unlock the drive carrier of the failed disk. This will turn off the alarm beep sound.

3. **I have connected the RAID controller, but it does not appear in the motherboard BIOS. Why?**
   Ensure that an array is initialized.

Appendix B

Glossary

Array

See Disk Array.

Array Management Software

The body of software that provides common control and management for a disk array. Array Management Software most often executes in a disk controller or intelligent host bus adapter, but may also execute in a host computer. When it executes in a disk controller or adapter, Array Management Software is often referred to as Firmware.

Cache

Controller memory used to speed up data transfer to and from a disk.

Disk Array

A collection of disks from one or more commonly accessible disk controllers, combined with a body of Array Management Software. Array Management Software controls the disks and presents them to the array operating environment as one or more virtual disks.

Firmware

See Array Management Software.

Host Computer

Any computer system to which disks are directly attached and accessible for I/O. Mainframes, and servers, as well as workstations and personal computers, can all be considered host computers in the context of this manual, as long as they have disks attached to them.

Parity

Parity information is redundancy information calculated from actual data values. If any single piece of data is lost, the data remaining and the parity information can be used together to compute the lost data. Parity information can either be stored on a separate, dedicated drive, or be mixed with the data across all the drives in the array.

RAID (Redundant Array of Independent / Inexpensive Disks)

A disk array in which part of the storage capacity is used to store redundant information about user data stored on the remainder of the storage capacity. The redundant information enables regeneration of user data in the event that one of the array member disks or the access path to it fails. See Parity. Different RAID levels offer different data throughput speeds and fault tolerance (data redundancy). RAID 0 does not feature redundant information but is nonetheless considered a special type of RAID.

Appendix C

Specifications

Host interface	One SATA-I
Disk interface	SATA-I (Support SATA-II but run in SATA-I)
RAID levels supported	0 and 5
Form factor	Two half height 5 ¼ inch
Dimensions	W5.75×D8.84×H3.35 (inch)
Weight	3.96 (lb)
Hot swap	Yes (Rebuilding is transparent & automatic)
Beeper alarm	Yes, built-in buzzer on board
FAN	Rated Speed: 4700RPM+/- 400RPM Noise Level: 35dB(A)

Note

Specifications are subject to change without notice.

Appendix D

Regulatory information

FCC Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

1. Reorient or relocate the receiving antenna.
2. Increase the separation between the equipment and receiver.
3. Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
4. Consult the dealer or an experienced radio/television technician for help.

The changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Shielded interface cables, if any, must be used in order to comply with the emission limits.

CE Mark

This equipment is in conformity with the EMC directive.

UL Listed

This equipment meets UL's safety requirements.

Appendix E

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